

IN THE CLAIMS:

Please rewrite the claims to read as follows:

Please cancel claims 1-39 without prejudice.

1 1-39. (Canceled)

Please insert the following new claims 40 *et seq.*:

- 1 40. (New) A method for use with classifying packets, comprising:
2 creating a plurality of logical segments, each of the logical segments correspond-
3 ing to a portion of a packet header;
4 iterating values in each of the plurality of logical segments from zero to a maxi-
5 mum value;
6 creating a bitmap for each of the iterated values, each bitmap having one or more
7 bits, each bit corresponding to a rule, each bit indicating whether a rule applies to the it-
8 erated value; and
9 grouping, to create an equivalency set for each of the plurality of logical seg-
10 ments, ranges of iterated values having equivalent bitmaps into one or more index sets,
11 each index set having an index number.
- 1 41. (New) The method as in claim 40, further comprising: cross-producting the equiva-
2 lency sets of each of the plurality of logical segments to create intermediate equivalency
3 sets.
- 1 42. (New) The method as in claim 41, wherein the step of cross-producting further com-
2 prises:
3 performing an AND operation on the bitmap of each of the one or more index sets
4 of two or more equivalency sets to create one or more new bitmaps; and
5 grouping, to create a new equivalency set for each AND operation, equivalent
6 new bitmaps into one or more new index sets, each index set having an index number.

1 43. (New) The method as in claim 41, further comprising: continuing the step of cross-
2 producting until a final equivalency set is created, the final equivalency set having one or
3 more final bitmaps.

1 44. (New) The method as in claim 43, further comprising:

2 receiving a packet having a packet header;

3 dividing the packet header into the plurality of logical segments, each logical
4 segment having a value; and

5 determining which rules apply to the packet by,

6 i) looking up the index set to which the value of each of the logical seg-
7 ments belongs,

8 ii) looking up the cross-producted relationships until the final equivalency
9 set is reached, and

10 iii) looking up a corresponding final bitmap.

1 45. (New) The method as in claim 40, further comprising: storing, as lookup tables, all
2 of the index numbers of the equivalency sets and their cross-producted relationships.

1 46. (New) The method as in claim 45, further comprising: deleting, from the equiva-
2 lency sets, all bitmaps but the one or more final bitmaps.

1 47. (New) The method as in claim 40, further comprising: using 16-bit segments as the
2 plurality of logical segments.

1 48. (New) The method as in claim 40, further comprising: dividing the packet header
2 into a plurality of logical segments including fields selected from the group consisting of:
3 source address, destination address, protocol, type of service (TOS), precedence, source
4 port number, destination port number, and flags.

1 49. (New) A method for classifying a packet using rules, comprising:
2 receiving a packet having a packet header;
3 dividing the packet header into a plurality of logical segments, each logical seg-
4 ment having a value; and
5 determining which rules apply to the packet by,
6 i) looking up a predetermined range to which the value of each of the
7 logical segments belongs, the range corresponding to a predetermined in-
8 dex set,
9 ii) looking up predetermined cross-producted relationships based on the
10 predetermined index sets to reach a final cross-producted relationship, and
11 iii) looking up a final bitmap corresponding to the final cross-producted
12 relationship, the final bitmap having one or more bits, each bit corre-
13 sponding to a rule, each bit indicating whether a rule applies to the packet.

1 50. (New) The method as in claim 49, further comprising: using lookup tables, the
2 lookup tables storing all of the index numbers of the equivalency sets and their cross-
3 producted relationships.

1 51. (New) The method as in claim 49, further comprising: using 16-bit segments as the
2 plurality of logical segments.

1 52. (New) The method as in claim 49, further comprising: dividing the packet header
2 into a plurality of logical segments including fields selected from the group consisting of:
3 source address, destination address, protocol, type of service (TOS), precedence, source
4 port number, destination port number, and flags.

1 53. (New) A computer, comprising:

2 means for creating a plurality of logical segments, each of the logical segments
3 corresponding to a portion of a packet header;

4 means for iterating values in each of the plurality of logical segments from zero to
5 a maximum value;

6 means for creating a bitmap for each of the iterated values, each bitmap having
7 one or more bits, each bit corresponding to a rule, each bit indicating whether a rule ap-
8 plies to the iterated value; and

9 means for grouping, to create an equivalency set for each of the plurality of logi-
10 cal segments, ranges of iterated values having equivalent bitmaps into one or more index
11 sets, each index set having an index number.

1 54. (New) A computer readable media, comprising: the computer readable media con-
2 taining instructions for execution on a processor for the practice of the method of,

3 creating a plurality of logical segments, each of the logical segments correspond-
4 ing to a portion of a packet header;

5 iterating values in each of the plurality of logical segments from zero to a maxi-
6 mum value;

7 creating a bitmap for each of the iterated values, each bitmap having one or more
8 bits, each bit corresponding to a rule, each bit indicating whether a rule applies to the it-
9 erated value; and

10 grouping, to create an equivalency set for each of the plurality of logical seg-
11 ments, ranges of iterated values having equivalent bitmaps into one or more index sets,
12 each index set having an index number.

1 55. (New) Electromagnetic signals propagating on a computer network, comprising: the
2 electromagnetic signals carrying instructions for execution on a processor for the practice
3 of the method of,

4 creating a plurality of logical segments, each of the logical segments correspond-
5 ing to a portion of a packet header;

6 iterating values in each of the plurality of logical segments from zero to a maxi-
7 mum value;

8 creating a bitmap for each of the iterated values, each bitmap having one or more
9 bits, each bit corresponding to a rule, each bit indicating whether a rule applies to the it-
10 erated value; and

11 grouping, to create an equivalency set for each of the plurality of logical seg-
12 ments, ranges of iterated values having equivalent bitmaps into one or more index sets,
13 each index set having an index number.

1 56. (New) A computer, comprising:

2 means for receiving a packet having a packet header;

3 means for dividing the packet header into a plurality of logical segments, each
4 logical segment having a value; and

5 means for determining which rules apply to the packet by,

6 i) looking up a predetermined range to which the value of each of the

7 logical segments belongs, the range corresponding to a predetermined in-

8 dex set,

9 ii) looking up predetermined cross-producted relationships based on the

10 predetermined index sets to reach a final cross-producted relationship, and

11 iii) looking up a final bitmap corresponding to the final cross-producted

12 relationship, the final bitmap having one or more bits, each bit corre-

13 sponding to a rule, each bit indicating whether a rule applies to the packet.

1 57. (New) A computer readable media, comprising: the computer readable media con-

2 taining instructions for execution on a processor for the practice of the method of,

3 receiving a packet having a packet header;

4 dividing the packet header into a plurality of logical segments, each logical seg-

5 ment having a value; and

6 determining which rules apply to the packet by,

7 i) looking up a predetermined range to which the value of each of the

8 logical segments belongs, the range corresponding to a predetermined in-

9 dex set,

10 ii) looking up predetermined cross-producted relationships based on the

11 predetermined index sets to reach a final cross-producted relationship, and

12 iii) looking up a final bitmap corresponding to the final cross-producted

13 relationship, the final bitmap having one or more bits, each bit corre-

14 sponding to a rule, each bit indicating whether a rule applies to the packet.

1 58. (New) Electromagnetic signals propagating on a computer network, comprising: the
2 electromagnetic signals carrying instructions for execution on a processor for the practice
3 of the method of,

4 receiving a packet having a packet header;

5 dividing the packet header into a plurality of logical segments, each logical seg-
6 ment having a value; and

7 determining which rules apply to the packet by,

8 i) looking up a predetermined range to which the value of each of the
9 logical segments belongs, the range corresponding to a predetermined in-
10 dex set,

11 ii) looking up predetermined cross-producted relationships based on the
12 predetermined index sets to reach a final cross-producted relationship, and

13 iii) looking up a final bitmap corresponding to the final cross-producted
14 relationship, the final bitmap having one or more bits, each bit corre-
15 sponding to a rule, each bit indicating whether a rule applies to the packet.

1 59. (New) A method for setting up lookup tables for classification of packets, compris-
2 ing:

3 A. establishing a plurality of fields for a header of a packet of the type to be clas-
4 sified;

5 B. inserting a first value into the first field;

6 C. comparing the first value with each of a plurality of rules, there being an es-
7 tablished number of rules in the plurality of rules;

- 8 D. setting a bit in a bitmap, the bitmap having a plurality of bits, each bit corre-
9 sponding to each rule of the plurality of rules, the bit being set in the event
10 that the corresponding rule applies to the first value;
- 11 E. repeating steps B, C, and D for each possible value which can be in the first
12 field to create a bitmap for each possible value;
- 13 F. grouping the bitmaps into sets, a set having equal values of the bits in the
14 bitmap;
- 15 G. assigning a label to each set; and
- 16 H. repeating steps B, C, D, E, F, and G for each field.

1 60. (New) The method as in claim 59, further comprising:

- 2 I. logically combining the sets of one or more fields with the sets of one or more
3 other fields to create intermediate sets.

1 61. (New) The method as in claim 60, further comprising:

- 2 logically combining the sets by performing an AND operation on the bitmaps of
3 the sets to create new bitmaps; and
- 4 grouping the new bitmaps into intermediate sets.

1 62. (New) The method as in claim 60, further comprising: logically combining interme-
2 diate sets until a final set is created, the final set having one or more final bitmaps.

1 63. (New) The method as in claim 62, further comprising: storing the sets in a plurality
2 of lookup tables.

1 64. (New) The method as in claim 62, further comprising: deleting, from the sets, all
2 bitmaps but the one or more final bitmaps.

1 65. (New) The method as in claim 64, further comprising:
2 receiving a packet having a packet header;
3 dividing the packet header into the plurality of fields, each field having a value;
4 and
5 determining which rules apply to the packet by,
6 i) looking up the set to which the value of each field belongs,
7 ii) looking up the logical combinations of set labels until the final set
8 is reached, and
9 iii) looking up a corresponding final bitmap.

1 66. (New) A computer, comprising:
2 A. means for establishing a plurality of fields for a header of a packet of the type
3 to be classified;
4 B. means for inserting a first value into the first field;
5 C. means for comparing the first value with each of a plurality of rules, there
6 being an established number of rules in the plurality of rules;
7 D. means for setting a bit in a bitmap, the bitmap having a plurality of bits, each
8 bit corresponding to each rule of the plurality of rules, the bit being set in the
9 event that the corresponding rule applies to the first value;
10 E. means for repeating steps B, C, and D for each possible value which can be in
11 the first field to create a bitmap for each possible value;

12 F. means for grouping the bitmaps into sets, a set having equal values of the bits
13 in the bitmap;

14 G. means for assigning a label to each set; and

15 H. means for repeating steps B, C, D, E, F, and G for each field.

1 67. (New) A computer readable media, comprising: the computer readable media con-
2 taining instructions for execution on a processor for the practice of the method of,

3 A. establishing a plurality of fields for a header of a packet of the type to be clas-
4 sified;

5 B. inserting a first value into the first field;

6 C. comparing the first value with each of a plurality of rules, there being an es-
7 tablished number of rules in the plurality of rules;

8 D. setting a bit in a bitmap, the bitmap having a plurality of bits, each bit corre-
9 sponding to each rule of the plurality of rules, the bit being set in the event
10 that the corresponding rule applies to the first value;

11 E. repeating steps B, C, and D for each possible value which can be in the first
12 field to create a bitmap for each possible value;

13 F. grouping the bitmaps into sets, a set having equal values of the bits in the
14 bitmap;

15 G. assigning a label to each set; and

16 H. repeating steps B, C, D, E, F, and G for each field.

1 68. (New) Electromagnetic signals propagating on a computer network, comprising: the
2 electromagnetic signals carrying instructions for execution on a processor for the practice
3 of the method of,

- 4 A. establishing a plurality of fields for a header of a packet of the type to be clas-
5 sified;
- 6 B. inserting a first value into the first field;
- 7 C. comparing the first value with each of a plurality of rules, there being an es-
8 tablished number of rules in the plurality of rules;
- 9 D. setting a bit in a bitmap, the bitmap having a plurality of bits, each bit corre-
10 sponding to each rule of the plurality of rules, the bit being set in the event
11 that the corresponding rule applies to the first value;
- 12 E. repeating steps B, C, and D for each possible value which can be in the first
13 field to create a bitmap for each possible value;
- 14 F. grouping the bitmaps into sets, a set having equal values of the bits in the
15 bitmap;
- 16 G. assigning a label to each set; and
- 17 H. repeating steps B, C, D, E, F, and G for each field.

1 69. (New) A computer for use with classifying a packet, comprising:

2 a memory to store,

- 3 i) a plurality of first lookup tables, each of the plurality of first
4 lookup tables having a plurality of predetermined first index sets,
5 the plurality of predetermined index sets corresponding to prede-
6 termined ranges of possible values for logical segments of a packet
7 header,
- 8 ii) a plurality of intermediate lookup tables, each of the plurality of
9 intermediate lookup tables having a plurality of predetermined in-
10 termediate index sets, the plurality of predetermined intermediate

11 index sets corresponding to predetermined cross-producted rela-
12 tionships between the predetermined first index sets, and
13 iii) a final lookup table, the final lookup table having a plurality of
14 predetermined final index sets, the plurality of final index sets cor-
15 responding to predetermined cross-producted relationships be-
16 tween the predetermined intermediate index sets, each of the pre-
17 determined final index sets having a final bitmap, the final bitmap
18 having one or more bits, each bit corresponding to a rule, each bit
19 indicating whether a rule applies to the packet;

1 70. (New) The computer as in claim 69, further comprising:

2 a port to receive a packet having a packet header; and

3 a processor to divide the packet header into a plurality of logical segments, each
4 logical segment having a value, and to determining which rules apply to the packet by,

- 5 i) looking up the first lookup tables to determine a predetermined
6 first index set to which the value of each of the logical segments
7 belongs,
8 ii) looking up the intermediate lookup tables to determine the corre-
9 sponding intermediate index sets based on the first index sets to
10 which the value of each of the logical segments belongs to reach a
11 corresponding final index set, and
12 iii) looking up a final bitmap corresponding to the final index set.